

CLAIMS

What we claim is:

- 1        1. An optoelectronic device, comprising:
  - 2                a first ohmic contact on a first surface of a silicon wafer and a second
  - 3                ohmic contact on a first area of a second surface of the silicon wafer;
  - 4                an aluminum nitride layer deposited on a second area of the second
  - 5                surface of the silicon wafer, a portion of the aluminum nitride having diffused into the silicon
  - 6                layer to form a p-n junction in the silicon wafer;
  - 7                a first layer of gallium nitride deposited on the aluminum nitride layer;
  - 8                a layer of indium gallium nitride deposited on the first layer of gallium
  - 9                nitride, the layer of indium gallium nitride having a top surface;
  - 10               a second layer of gallium nitride deposited on a first area of the top surface
  - 11               of the indium gallium nitride layer and an ohmic contact on the second layer of gallium nitride;
  - 12               and
  - 13               a second ohmic contact on a second area of the top surface of the layer of
  - 14               indium gallium nitride.
- 1        2. The device of claim 1 wherein the thickness of the first and the second gallium
- 2               nitride layers and the indium gallium nitride layer is in the range from about 0.5 to about 1
- 3               micrometers.

1           3.     The device of claim 1 further comprising a multi-quantum well heterostructure  
2     between the first layer of gallium nitride and the silicon wafer.

1           4.     An optoelectronic device, comprising:  
2                   a silicon substrate;  
3                   a layer of semiconductor deposited on the silicon substrate;  
4                   an ohmic contact with a first area of the layer of semiconductor;  
5                   a metal-insulator layer on a second area of the layer of semiconductor to  
6     form an M-I-S Schottky contact;  
7                   a layer of a transparent electrode on the metal-insulator layer to form a  
8     metal-insulator-semiconductor Schottky contact on the second area of the layer of  
9     semiconductor, the layer of transparent electrode having an ohmic contact thereon;  
10                  a multi-quantum well heterostructure on a third area of the layer of  
11     semiconductor;  
12                  a gallium nitride layer deposited on the multi-quantum well  
13     heterostructure and having an ohmic contact; and  
14                  a layer of a transparent electrode deposited on a part of the layer of  
15     gallium nitride, the layer of transparent electrode having an ohmic contact.

1           5.     The device of claim 4 wherein the transparent electrode is comprised of fluorine-  
2     doped tin oxide.